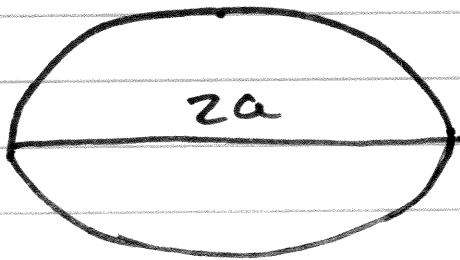


9.2 Ellipses

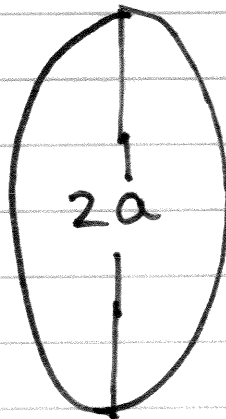
horizontal:

$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$



vertical:

$$\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$$



a is the bigger #
and it is the longer axis

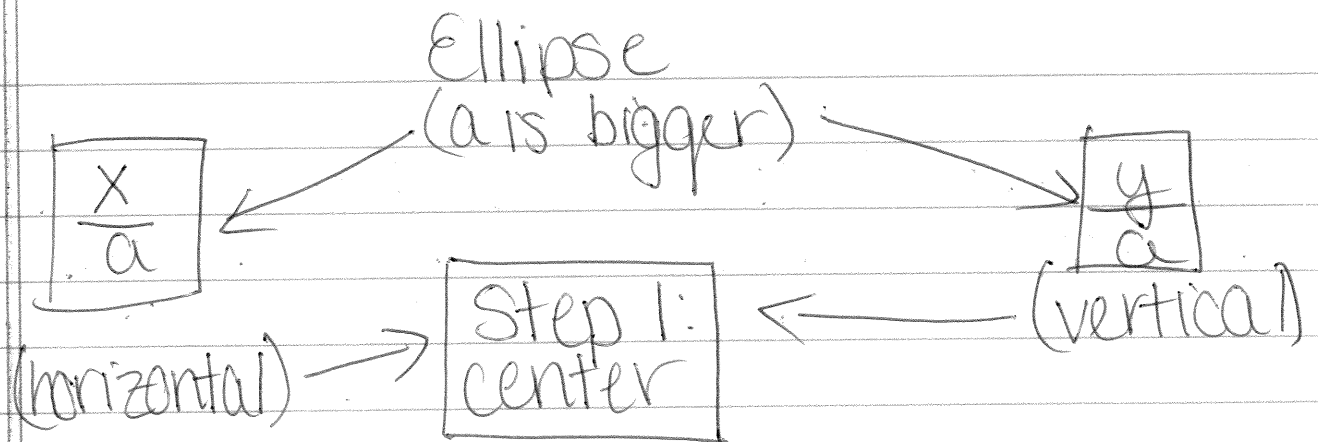
ex: Rewrite + find all the stuff

$$4x^2 + y^2 - 8x + 4y - 8 = 0$$

$$\left. \begin{array}{l} 4x^2 - 8x \rightarrow 4(x^2 - 2x + \underline{(-1)^2}) \\ y^2 + 4y \rightarrow y^2 + 4y + \underline{2^2} \end{array} \right\} = \begin{array}{l} 8 + 4(1) + 4 \\ 8 + 8 \end{array}$$

$$\frac{4(x-1)^2}{16} + \frac{(y+2)^2}{16} = \frac{16}{16}$$

$$\boxed{\frac{(x-1)^2}{4} + \frac{(y+2)^2}{16} = 1}$$



(h, k)

Step 2:
find c

$$c = \sqrt{a^2 - b^2} \rightarrow \text{need this for foci}$$

Step 3:
vertices

- ① $(h+a, k)$
- ② $(h-a, k)$

- ① $(h, k+a)$
- ② $(h, k-a)$

Step 4:
foci (both)

- ① $(h+c, k)$

- ② $(h-c, k)$

- ① $(h, k+c)$

- ② $(h, k-c)$

Step 5:
major/minor
axis

a = major

b = minor

Writing the standard form

(ex:) vertices $(\pm 3, 0)$ foci $(\pm 2, 0)$

all of the y's are the same \rightarrow
 $\frac{x}{3}$

center is $(0, 0)$ b/c that is the midpt btwn the vertices.

$$\text{foci} = (h \pm c, k) \\ (0 \pm 2, 0) \checkmark$$

$$c = \sqrt{a^2 - b^2} \rightarrow 2 = \sqrt{3^2 - b^2}$$

$$4 = 3^2 - b^2$$

$$4 = 9 - b^2$$

$$-5 = -b^2 \rightarrow b = \sqrt{5} \checkmark$$

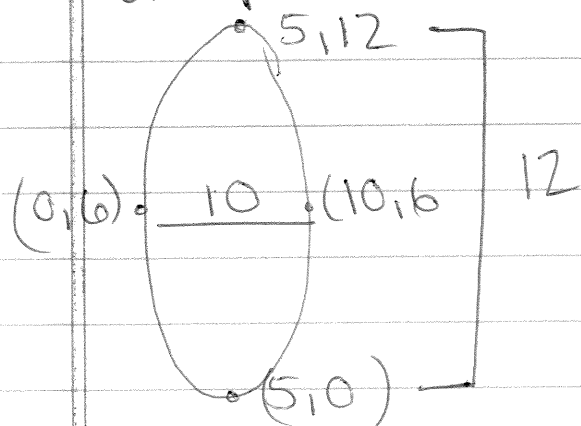
$$\text{finally: } \frac{(x-0)^2}{3^2} + \frac{(y-0)^2}{\sqrt{5}^2} = 1$$

$$\boxed{\frac{x^2}{9} + \frac{y^2}{5} = 1}$$

ex2) rewrite in standard form

vertices $(5,0)$ and $(5,12)$

endpts of minor axis $(0,6)$ and $(10,6)$



$$a = 6 \quad b = 5$$

center @ $(5, 6)$

$$\frac{(x-5)^2}{5^2} + \frac{(y-6)^2}{6^2} = 1$$

so:

$$\boxed{\frac{(x-5)^2}{25} + \frac{(y-6)^2}{36} = 1}$$

hints: if given endpoints or the length of the major/minor axis, draw a picture! It makes finding other info way easier.